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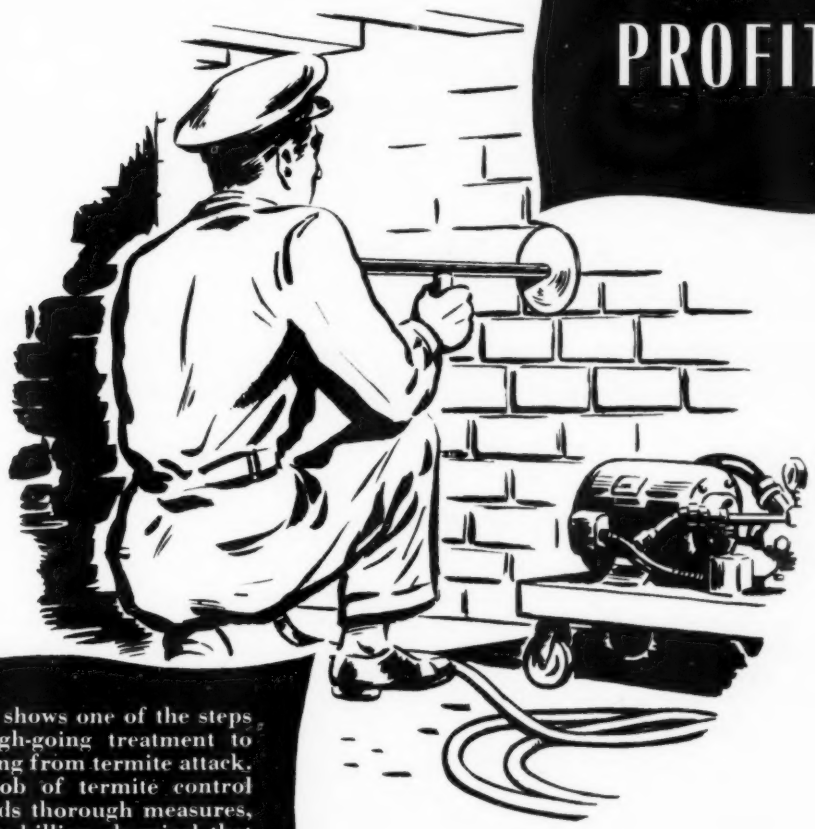

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## *Direction?*

"Bedbug eradicators," "rat killers," "bug chasers" — these were the terms generally associated with the exterminators of yesterday. Their duties were defined; their services specific. Public thinking and the industry's development has changed these conceptions.

Our recent survey conducted to determine reader interest revealed professional pest control operators no longer confine their service to only the structural phase of control. To combat declining calls for household service, they have broadened their operations to include arborial, lawn, shrub and even flower pest control. A large percentage has asked for more information on sanitation services of which pest control is an integral part.

Outside of agriculture, which is a separate field in itself, the pest control problems of parks, cemetaries, nurseries, tree growers and those normally encountered in homes, factories, storehouses and manufacturing facilities are all being serviced by PCOs who realize there is a wider demand for the specialized care they have to offer. The number of termite operators is also increasing.

These are the directions, then, pest control men are following. They are servicing "special" control problems arising from infestations caused by the not-too-common insect, in addition to routine fly, mosquito, rat, mouse and cockroach situations. Pest control encompasses many different kinds of businesses with many new opportunities, a fact industry men who plan for the future are taking into consideration.

James A. Nelson

Editor


PEST CONTROL

FORMERLY PESTS AND THEIR CONTROL

JAMES A. NELSON
Editor

JOSEPH R. GROSS
Associate Editor

HENRY A. NELSON
West Coast Representative

**SEPTEMBER, 1949** **VOL. 17, No. 9**


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# LETTERS...

### Like Shorter Name

I think congratulations are in order on the shortening of the name of your fine publication to *Pest Control*. It reads faster and I think will overcome one of the problems you may have noticed in the use of the former name of your magazine. I have noticed that most people were inclined to call it simply "Pests" which did not adequately describe the book. I am sure you will find more people calling your book *Pest Control*, now that the name has been shortened.

*R. O. Guether*
Advertising Manager
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Our congratulations on the new name. It is both a logical and desirable innovation.

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### Depends on Advertising

May we take this opportunity to congratulate you on the vastly improved *Pest Control*. The tips and articles have pulled us out of many tight spots. The suppliers listed in your advertisements can meet any requirement of the pest control industry and we always buy our supplies right out of the book.

*G. L. Bowles*
The Allison System
Ashbury Park, N. J.

### Bat Control

I wonder if I could ask you to give me some information on the control of bats — what they eat, how to catch them. Any information will be appreciated. I have a very nice theatre that has them now and then.

*V. F. McDougall*

*Bats feed for the most part on night-flying insects, which makes them of great value to man. They should not be destroyed if alternate means of control will produce satisfactory results. Two to five pounds of flake naphthalene or paradichlorobenzene scattered where bats are present can be used to drive them out of their roost (usually some, dark unused shelter) once it has been located. Both chemicals dissipate rapidly on contact with air, hence applications may have to be repeated if no other method is used. 100 per cent concentrated ANTU powder dusted about the entry way with a bulb duster has worked in some instances to kill most of the bats. Any fumigant, (calcium cyanide is most often employed) carefully used, will also kill the animals, but in each case there is no degree of permanency and unrecovered carcasses will decompose to cause an unpleasant odor.*

*Bats may enter the theatre through large openings such as unprotected louvres or vents, chimneys, broken windows or other open spaces or they may find small openings in sidings around eaves, etc. The smaller species of bats can crawl through an opening as narrow as 3/8-inch.*

*One authority says the best procedure is to close all but 1 or 2 of the principal openings during the day, then wait 2 or 3 days until the bats have learned to use the only entrances left them. In the evening after the last bat has left the roost for feeding, close the remaining openings, being sure, of course, all bats are out.*

*Larger openings should be covered with 1/4-inch mesh hardware cloth, depending upon whether or not ventillation is necessary, or repaired if there is something wrong structurally. Smaller openings, cracks, etc. should be plugged and caulked. It is usually necessary to watch the building for several days at dusk to make sure which openings are being used and to determine if there are any that have been missed.*

### Purdue Bulletins

It occurs to me that some of your readers may be interested in having a copy of our recent bulletin on how to collect insects. It can be obtained by writing the Purdue Extension Mailing Room, Agricultural Experiment Station Building, Lafayette, Indiana and enclosing eight cents in stamps.

The women's placement service has recently issued a bulletin on opportunities for women and in it are discussed opportunities for women in entomology. If there are any interested, this bulletin can be obtained free of charge by writing to the Placement Service for Women, Purdue University, Lafayette, Indiana.

*J. J. Davis*
Chief in Entomology
Purdue University

*We have not seen the bulletin offering opportunities for women, but the other, entitled, "Insects, How to Collect, Preserve and Identify Them," is one every pest control man should have. It is a 36-page booklet, generously illustrated with many insect pictures. Details are given on "collecting equipment," where and how to collect the insects, how to handle and preserve them and how to pin them to display boxes. There are also precautions given and information on how to rear and identify insects. Professors G. E. Lehker and H. O. Deay of Purdue's Division of Entomology, authors of this publication, have presented practical and useful information. It is well worth the very small cost involved.*

### More Reprints

*A number of readers sent in for copies of the reprints of past articles listed in the August issue of Pest Control, indicating there is an interest in what has been written before.*

*Below are listed additional articles for which we have a limited supply of reprints on hand. If you desire copies of them, they will be sent to you if you send with your order the amount listed after each title, in stamps or coins.*

*"Pests Are Optional"* by Bartlett W. Eldredge, August 1948, 4 pages, 15 cents.

*"Wall Void Treatment in Termite Control"* by George L. Hockenyos, March 1949, 6 pages, 20 cents.

*"Why the American Association is Interested in the Pesticide Problem"* by Bernard E. Conley, April 1949, 4 pages, 15 cents.

*"Sprayer Maintenance Forum"* by Industry leaders, May 1949, 4 pages, 15 cents.

*"Food Plant Sanitation"* by John L. Harvey, October 1946, 3 pages, 15 cents.

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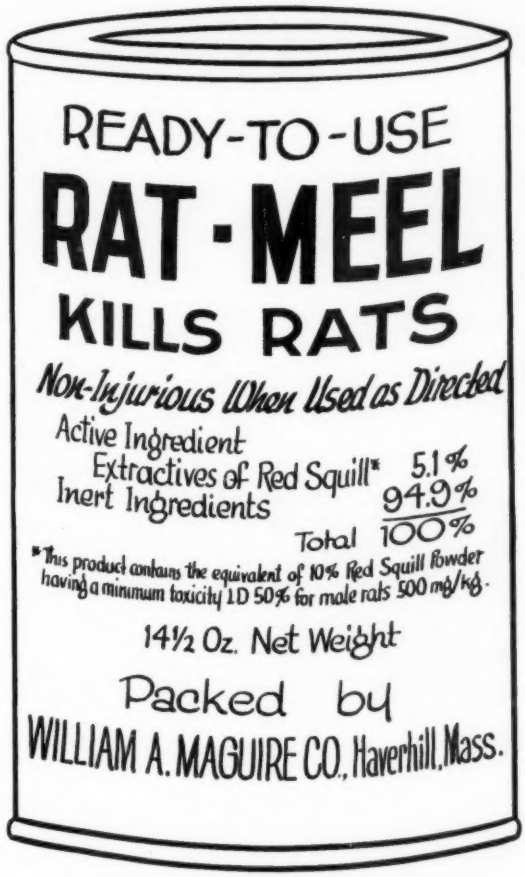
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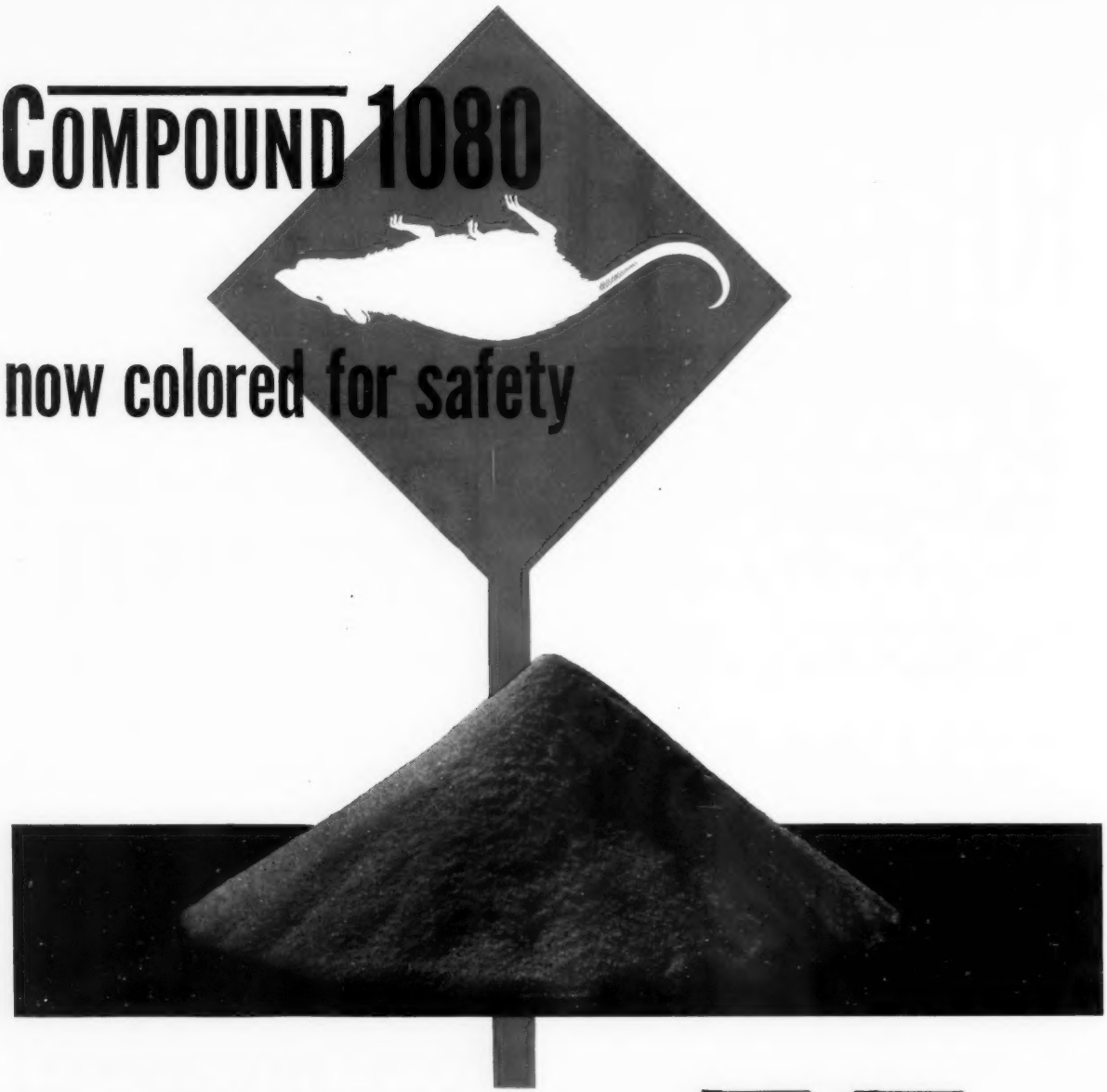

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SERVING INDUSTRY . . . WHICH SERVES MANKIND

# DISEASES Carried by House Mice

By DR. T. M. W. CAMERON

Director, Institute of Parasitology, Macdonald College, McGill University
Montreal, Quebec, Canada

IT IS WELL known that rodents harbor many organisms which can cause disease in man; it is equally well known that rodents which come into close contact with human beings, are the most dangerous species. Yet practically all the work of the past few decades on the epidemiology of these diseases, has been concentrated on the various species of rats, to the almost complete exclusion of the most domesticated of all rodents, the *House Mouse*. It obviously plays a lesser part than do rats in the transmission of some of these diseases; it equally obviously plays some part — perhaps a relatively minor one — in their transmission. The purpose of this article is to indicate what is actually known about this subject.

In considering communicable diseases common to mice and men, it is probably most convenient to discuss them according to their methods of transmission and there are eight possible methods.

(1) By biting man.
(2) By infecting human food with its droppings.
(3) By infecting human food with its urine.
(4) By being eaten.
(5) Indirectly via the cat or the dog.
(6) Indirectly via the blood-sucking insects.
(7) Indirectly via blood-sucking mites.
(8) Indirectly by dying in a water supply and contaminating it with organisms contained in its body at death. There is no evidence that this has happened, although it is a possibility which must be considered.

The more important mouse diseases are discussed in this order, although it is obvious that some may have several means of transmission; in these cases, they are placed under their most important method.

(1) *Rat-bite fever* is usually regarded as a tropical disease but is probably cosmopolitan. It is caused by a motile bacterium *(Spirillum minus)* and is most commonly conveyed by the bite of a rat. It does occur in nature in mice, however, but as these animals less frequently bite man, they are not regarded as such serious transmitters of the disease as are rats. However, cats, dogs, ferrets, and weasels, can contract the disease from rodents and convey it in turn to man by their bite. The disease is of the relapsing fever type, the first bout of fever occurring about ten days after the bite. The temperature returns to normal in four to six days, is absent for several days and then returns. Up to about a dozen of these relapses may occur.

(2) No animal has more favorable opportunity of infecting human food with its droppings than has the house-mouse and it is remarkable how little attention has been given to this means of infection even although it is well known that mice are frequently infected with organisms which are passed in these droppings. Among the most common diseases which which can be transmitted by mice in this way are the *Salmonelloses* — one of the more serious kinds of food poisoning or gastroenteritis. While seldom fatal, these food poisoning outbreaks are so common as to be classed as one of our most important disease entities.

Mice are very susceptible to infections with bacteria called *Salmonella enteritidis*, and *S. aertrycke* (= typhi-murium), and can act as carriers for a long time, excreting the organisms in their droppings.

*S. aertrycke* is frequently called the *Mouse typhoid* bacillus and it often causes serious disease in these animals: epizootics with a mortality rate of 20 per cent to 80 per cent are on record. While the infection often causes a disease, carrier cases are common and the mice pass the organism in their droppings for long periods during which they appear healthy. Apparently, *S. enteritidis* can cause a clinically identical disease in mice.

**Not often regarded as carriers of serious diseases, Dr. Cameron reveals how house mice do transmit them to man.**

There have been numerous outbreaks in human beings attributed to the contamination of food by mouse droppings, and it is probable that domestic animals and birds can also be infected from this source; pigeons appear to be especially susceptible. *S. aertrycke* does *not* cause typhoid fever in man but acute gastro-enteritis (or "food poisoning"). It is the main cause of these conditions, the second most common cause being *S. enteritidis*. These are the only two species which occur naturally in mice; they are very common in them in all parts of the world.

Contamination of food by droppings and urine is a source of human infection, although not the only one, because food animals also can be infected and fresh meats and eggs may contain these or related species of *salmonellas*. However, cooked foods causing violent explosive outbreaks of food poisoning in six to 72 hours after ingestion, are most probably due to contamination by infected rodents. The condition may be caused by the actual bacteria or by the products of the bacteria in the food stuffs; these bacteria grow well in most non-acid foods (e.g. liquids of cooked vegetables, made-up foods and salads) which are not properly refrigerated.

*Hymenolepis nana* and *H. diminuta* are two small tapeworms which can also be transmitted to man, directly or indirectly through the droppings of mice (and rats). The latter is rare, but in the warmer parts of the world, *H. nana* is common. The tapeworm is a small form, under an inch long and causes little if any harm to the host. It is one of the few worms which can develop directly, i.e., man or mouse becomes infected by swallowing the microscopic egg as a faecal contamination of food and the little worm grows directly in the small intestine.

(3) Urine-carried organisms are less common than faecal-carried organisms, but there is at least one of considerable importance. This is the spirochaete-like organism called *Leptospira*, which is common in rats. Curiously enough, the domestic mouse, although very easily infected by inoculation, does not seem to contract the infection frequently in nature. It has been suggested that infection is primarily from water and that as rats frequent sewers and other sources of foul water, they contract their infections there; the dislike of mice for water, may be the only reason why they are naturally free from the disease. However, there are records of their being infected. Human infection is caused by contamination of food and water by urine of infected animals. The disease in man (Weil's disease) can be a serious one and there are indications that it is becoming more common in North America.

(4) There is no evidence that man has ever been infected with any disease by eating mice, but he could be. It is otherwise with cats. Their most important tapeworm is contracted by eating mice and, in Europe, a serious round worm which lives in their lungs, is acquired in the same manner. The lung worm is absent from North America. Mice pick up the infection by feeding on the cat's droppings and in turn, pass it on to the cat. Neither worm occurs in man.

### Indirect Transmission

THE FOREGOING diseases are all transmitted directly; the remainder are carried from mice to man by some intermediary.

(5) *Favus* is a fungal disease of the skin caused by a mold which, entering the hair follicles and surrounding skin, causes the formation of small crusts. These, increasing in size, become elevated at the margin to form a cup-shaped yellow scab; this latter becomes brown in color, falls off and leaves bald patches. It can be transmitted to man, either directly or indirectly from mice. The indirect method is by infecting a cat, which in turn, infects the human beings in the same house. "Favus houses" have been recorded from Switzerland, because of the large number of human cases occurring in them, apparently contracted from the local mice (which were also infected). *Favus*, however, occurs in all parts of the world.

(6) *Plague*, one of the greatest of the human scourges, is basically a disease of rodents, and human plague epidemics mostly originate from rats. However, on a number of occasions, house-mice have been found infected and these have carried infected fleas. Many species of rodents are susceptible to plague and infections are carried from rodent to rodent by fleas. It is only when domestic rodents are infected, that the condition becomes really serious so far as public health is concerned, Wild rodents pass the infection to gray rats; gray rats pass it to black rats. They die in houses and their fleas, carry the infection to man. Fortunately, house mice do not seem to be often infected. In any case, while they can serve as suitable hosts for the fleas which carry the disease, their small size prevents any individual mouse having a heavy infestation.

*Endemic* or *Murine Typhus* is usually contracted from rats, but at least one outbreak was traced to house mice. It is essentially a disease of warm countries (e.g. south-east U.S.A.). The causal organism is a rickettsia which is conveyed from rodent to rodent by lice and from rodent to man by fleas. The flea most commonly implicated is the tropical rat flea. This flea, while preferring rat blood to human, can, if the association is close, be transferred to man and will feed freely on human blood. The flea is not injured by the organism — and neither, as a rule, is the rodent. Accordingly, the disease in man is sporadic (unlike the case of bubonic plague). However, the organism (as in the case of true typhus) can be conveyed from man to man by the human body louse and so endemic typhus could, under suitable, unhygienic conditions, become epidemic.

The tropical rat flea (which will live on mice and man) is thus responsible for two serious diseases. It is no longer tropical because modern heating systems have extended its range as far north as Canada. Murine typhus is also extending its range and,

## Closely related virus in mice indicates they may have been the original carriers of Poliomyelitis

while not recorded from Canada, is becoming increasingly frequent in the United States.

*Rickettsial pox* is the most recently described mouse disease transmissible to human beings. In man, it causes a disease resembling but otherwise distinct from chicken pox. It also is caused by one of the Rickettsiae *(R. akari)* and from these two circumstances it has received its name. It is transmitted from mouse to man through the agency of a blood-sucking mite, *Allodermanyssus sanguineus.* While only recently discovered and consequently only known from the New York area, there is no reason to believe it is limited to that area. This disease is in no way connected with mouse typhus, mentioned above.

There is a number of other mouse diseases which appear to occur in man, or at least closely resemble some which do. These include:

(a) *Lymphocytic choriomeningitis* is a virus disease of man and a virus infection of mice in America and Europe. The disease in man is a form of meningitis characterized by an increase of white blood cells in an otherwise bacteria-free cerebo-spinal fluid. It runs a benign course with no complications. It is found particularly between the ages of ten and forty. Recovery is followed by a solid immunity.

It is still uncertain how human beings become infected but a history of close contact with house mice has been recorded in a number of cases. Mice can be infected by swallowing the virus and it can be excreted in the urine. Accordingly, the direct infection of man by urine or faecal contaminated food must not be overlooked. However, droplet infection from infected persons (as for influenza and pneumonic infections) is at least equally probable. The part played by the mouse is still uncertain, the evidence circumstantial.

(b) *Histoplasmosis* is a rather rare disease of man recorded from various parts of the world but most frequently from the United States. It is carried by a minute organism *(Histoplasma capsulatum)*, which lives in the white blood cells and cells of the bone marrow, liver and spleen. The organisms have been reported from the house mouse but it is not yet proved that they are identical or that the mouse is the source of human infection. The route by which man becomes infected is, also, still unknown.

(c) *Tularaemia* has been recorded naturally in mice on several occasions. It is caused by an organism related to that causing plague; it also occurs in a large number of rodents. Man becomes infected in most cases by handling of infected carcasses. Accordingly, while it can be a serious risk to those handling game and fur rodents, there seems little chance of mice infecting man.

There are also several diseases in mice which are *not* transmissible to man. These include Mouse "tuberculosis" and Mouse "septicaemia."

*Pseudo-tuberculosis (Pasteurella pseudotuberculosis)* Although most commonly seen in rats and guinea pigs this condition is also found in mice. It may be serious in guinea pigs. Its greatest interest, however, lies in the fact that the organism closely resembles that causing plague and may be mistaken for it. It is not caused by the bacillus of tuberculosis and is in no way related to that disease.

*Mouse septicaemia* is caused by an organism called *E. murisepticus* similar to or identical with, that causing swine erysipelas and an epidemic was recorded in California in 1927. So far as is known, it is not transmissible to man.

*Mice and Poliomyelitis*—There is no evidence that mice cause polio in man; all the evidence points to a direct or indirect human to human infection. Nevertheless, there is at least a possibility that mice were the *original* carriers of the infection. An extremely closely related virus occurs in these animals and occasionally causes a disease in mice called Theiler's Virus Disease which very closely resembles the experimentally produced poliomyelitis in the same species of animal (produced by a virus from man). Most infected mice show no symptoms of Theiler's disease and are carriers, the infection being transmitted by the ingestion of material contaminated by faeces. Many competent authorities believe that the virus of the mouse disease and of poliomyelitis had a common origin, although they are now distinct, and that that common origin was the mouse. A chance mutant fo the rodent virus deposited in mouse faeces on human food, may have been the origin. While this is pure speculation, it is a fact that there is no evidence that the mouse is at present, a source of human infection with poliomyelitis.

While this review includes the diseases known to be transmitted by mice, it cannot be inferred that it is complete. Far too little work has been carried out with mice to enable such a statement to be made. However, enough has been done, to justify a demand that more should be carried out.

# Some Ways to Have Better Trained Servicemen

by

**BY DR. J. J. DAVIS**
Chief in Entomology, Purdue University

THERE IS NO *one* training program for the service operator that is "best," but there are a number of opportunities available today which help to provide a better-trained pest control industry, including owner-operators and service men. These are briefly discussed below in order of their importance to the industry, but they may rank differently on a local training level.

1. *Annual Convention.* The National Pest Control Association and its accompanying annual convention should be considered the most important motivating force in the industry, a force which should be supported and attended religiously. It is self-evident that an industry covering the nation, and including Canada, is successful only so far as it is united and supported by a sizable majority of its members.

The national association was born of necessity and from the beginning it has included in its annual convention educational features as well as business sessions. A national convention may be intended primarily as a business meeting for the formulation of policies, but at the NPCA yearly meeting, educational features are still maintained in the program. This one phase alone insures bringing to the meeting outstanding scientists in the field of pest control. There is no question that an acquaintance and understanding between technical men and the pest control operators is doing much to promote the pest control industry. I cannot emphasize too strongly the importance of each pest control operator affiliating himself with the national and state industry associations. But affiliation is not enough; it is important that you also attend and participate in the activities of the group.

2. *Regional Conferences.* Regional conferences, organized to provide educational advantages in the field of pest control, were established at our institutions of higher learning to take advantage of a better entomological approach and of the opportunities to utilize laboratory facilities in a scientific approach to the various phases of pest control. It was also the objective of the conferences to aid in the solution of pest problems, to bring new developments before PCOs, and to provide a place to meet and exchange ideas and experiences. These regional conferences have as their ultimate goal a means of providing information and help which should raise the standards of pest control service, develop ethical and effective procedures in the industry and insure a dependable and profitable service. The increasing attendance at the Purdue meeting alone in the last 13 years is evident that these meetings are proving valuable to the pest control operators and service men who take advantage of the opportunities they offer.

3. *State Associations.* The pest control operators of many states have organized their own state associations which function principally for business purposes on a state level similar to the N P C A's service on a national level. These state associations have a real function in legislation and in maintaining high standards within the state. Even though they are concerned primarily with the business phases of pest control, they do also foster some excellent educational features on their program. Much can be gained through regular attendance of these association meetings.

4. *State Educational Meetings.* Several state associations have sponsored state educational meetings lasting one or two days at which specific problems are considered. In most cases these meetings have the cooperation and support of the state college or university. Such meetings are highly desirable, especially when they emphasize some one particular subject each year, such as identification, insecticides, termite control, etc. An outstanding example of such a state educational meeting is that sponsored by the New Jersey College of Agriculture and Experiment Station, where a one-or-two-day intensive program of some specific problem has been given each year. One year their attention was focused on termites, another on ants, and still another year on insect identification. With the smaller attendance at these state meetings, it is possible to give individual aid which is not permissible at regional conferences.

As a word of caution. I would like to suggest that general meetings, where a wide range of subjects are covered, similar to the program offered at regional conferences, usually are of questionable value at a state level. They tend to overlap the regional conferences. If each state or several states combine to hold a general three-to-five-day conference, the value of both the state and the regional conferences would be reduced because it would not be possible to secure talent for a meeting held by each state as well as by the region. It must be recognized that there is a limit to the time and money which anyone can spend for such meetings. There is a place for both kinds of educational conferences, but the state meeting should consider more specialized problems and leave the consideration of broader problems to the regional conferences.

5. *Firm Meetings.* Many of the larger pest control establishments provide weekly or monthly

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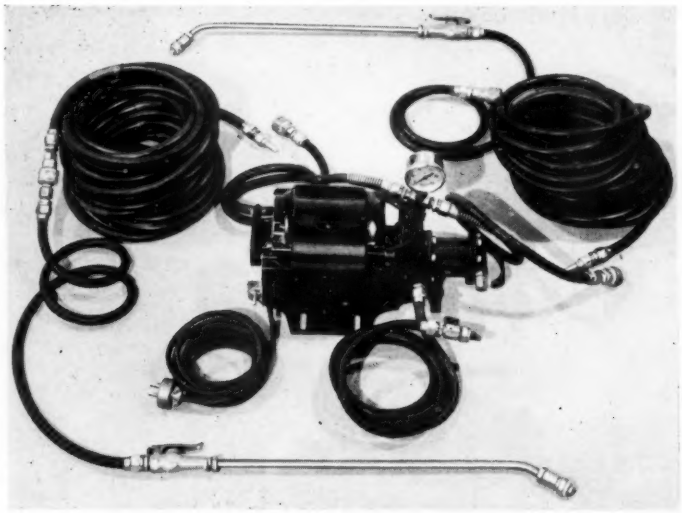

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meetings for their service men, which may be considered training schools. Where organizations have offices in a number of cities, an annual meeting of several days is often provided. Such sessions are essentially training schools in technique, sales, ethics, and so forth. Such meetings are highly desirable and serve to maintain an *esprit de corps* and a high standard of service.

6. *Four Year College Curriculum.* For pest control operators and service men who desire a more formal training in pest control work, there is available at Purdue University a four-year curriculum of college calibre. Designed primarily for those younger men desiring to enter this industry, the Purdue course also enables more seasoned men to brush up on some principles or learn new techniques, etc. The complete program was fully outlined in the July issue of *Pests and Their Control.*

Those opportunities listed above which enable industry personnel to become better trained are, perhaps, the more obvious. Nevertheless, they are valuable and use of them should be regularly made if we are to join together to share our experiences with one another and take advantage of the professional research being conducted by our universities, and state and federal experiment stations.

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## Florida Termites

Dr. E. M. Miller, head of the Department of Zoology at the University of Miami, is the author of a new book, "Florida Termites," just published. This book, according to Dr. Miller, will be a handbook on the biology and identification of all known species of termites in Florida. It is designed, he said, for the use of PCOs, entomologists and for interested householders. "Florida Termites" is illustrated and contains 48 pages. Inquiries may be addressed to The Editor, University of Miami Press, Coral Gables 34, Florida. Exact price is not known, but reports are that it will sell for less than one dollar.

PEST CONTROL

# notebook

by

J. R. Gross

•

## King Cotton: Super Fly Chaser

"Paste a wad of cotton on the middle of the door
And those doggone flies 'll pester you no more."

So the legend goes. Every year I hear it several times along with those about singeing rats and snakes milking cows. Patiently I explain that there isn't anything to it. How can a little fluff of cotton stuck on the door keep flies out of the house? They tell me the theory is that flies, surveying the place, mistake the fluffy wad for spider webs and so skoot away in terror.

Last week I was surrounded by a half dozen advocates. They swear by it, the cotton trick, that is. I even had to visit two of the homes to see where it was "actually working." The "Mrs." had heard about it on a radio hint program. The argument ended with me promising to run some "experiments."

It so happens there's a fur farm I know where the flies breed by the millions (even literally that figure isn't far off). Actually the fly specks are so thick they form lumps on the ceiling. So, with a foolish look on my face and a pound of pure cotton in my hands, I set off to run my unscientific tests.

The day was hot, around 96°F. House flies were thick everywhere except on the screens. Blue bottle flies were congregated in large numbers resting on the shady side of the buildings. Green bottle flies were busy laying eggs in drums of meaty horse bones. A few worm flies were there, too.

### First Test

House flies, thousands of them, were busy sopping a meal on the fouled-up wet concrete floor. I put down the wads of cotton right in the busiest spots. Soon they were back feeding. But you know, they weren't very happy around the cotton. A very few would land for split-second periods on the wad itself. It certainly wasn't accepted as a place to settle down.

### Second Test

Wads of cotton were fastened to the wall in the midst of the resting blue bottle flies (species undetermined). Here the reaction was even more pronounced. The flies would buzz up as though to land and then moved on. Those that settled close to the wad were easily frightened by others buzzing the cotton. Net result was a small area of about six inches radius almost free of the blue flies.

### Conclusions

I'm going to spend a lot more time studying fly habits at my favorite fly ranch. Perhaps the fuzzy threads of cotton are set in motion by the wings of the flies. This motion frightens them a little so that they tend to avoid the immediate area. Whatever the cause, the reaction is so slight, however, that no actual control results.

---

## Know Your County Agent

Every man doing pest control work should become acquainted with the county agricultural extension agent in his territory. His office is located in the county-seat. As a public servant, the agent has a wealth of government and state bulletins on numerous pest control subjects which are usually available free of charge. In addition, you will become better acquainted with the current and projected pest control projects in the locality and may even be able to land some of the jobs.

The agricultural agent's opinion is often sought by business men in the community. If you have convinced and demonstrated to the agent you can do reputable work, you may well figure in his recommendations. Cooperate with him, too, to help solve some problems he may have. This relationship will be to your mutual benefit.

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# INSECT RESISTANCE TO INSECTICIDES


## by H. A. U. MONRO

**Officer-in-charge, Fumigation Laboratory**
**Dominion Department of Agriculture, Montreal, Quebec, Canada**


**IN TWO PARTS:**

## Part One

THE ATTENTION given to observations on increased resistance of houseflies to DDT is typical of the publicity which has pursued this compound ever since it was first used as an insecticide. It must not be forgotten, however, that entomologists have been studying the general subject of insect resistance to chemicals almost from the time that this type of control and was introduced on a large scale. An intelligent appraisal and discussion of the present housefly problem can only be based on a knowledge of the previous history of insect resistance, backed by some understanding of the broader genetic principles involved. The subject has already been rather fully discussed in the reviews of Smith (1941) and Quayle (1943), both of which appeared in the *Journal of Economic Entomology*, and the reader is referred to them for a more detailed treatment of the history of this problem.

Apart from the immediate economic importance of this subject, it is also of scientific interest inasmuch as new factors have been introduced into the environment by the use of chemicals, so that some of the theories advanced to explain the operation of natural selection, as part of the evolutionary process, can be tested and compared under field and laboratory conditions. Dobzhansky (1941) in his treatise, "Genetics and the Origin of Species," has used some of the observations made in this problem as a basis for illustration.

In considering this matter, and writing about it, the distinction between "laboratory" and "field" results and observations must be kept constantly in mind. The necessity for this will become increasingly obvious as the article is read.

### Discussion of Terms

Before we begin, it is advisable to examine the significance of some of the terms used, often rather loosely, in dealing with this subject.

*Resistance*: When we talk of resistance to insecticides, or some other unfavorable factors, we imply the resistance of a *population* of the insect species concerned. It is a common, and probably universal, observation that a few individuals in a population will succumb to very light applications of toxicants, and that a high percentage of the group will survive. At the other extreme, very severe treatments may still allow a few survivors. Variations in "resistance," therefore, will be found between the possible extremes of immunity at one end and complete susceptibility at the other. If we wish to speak of the individual response we should qualify the statement by saying "individual resistance." In fact, in dealing with the individual reaction, "tolerance" or "individual tolerance" should preferably be used, indicating the greatest amount of a chemical or other unfavorable agent which can be administered to a test animal without producing the type of result, such as death or unconsciousness, which is being studied at the time. The definition of "increased resistance" given by Quayle can be accepted as very fitting. He says increased resistance "refers to the decreased effectiveness of the insecticide at the present time as compared with former years."

*Mutation*: In this discussion it is essential to touch on aspects of the theory of evolution and some of the explanations afforded by the science of genetics to explain evolutionary developments through progressive variations in the population. "Mutation" is the term usually employed to indicate permanent changes in the "determiners" of heredity. As these determiners have been shown to be principally the genes present in the chromosomes of the germ cells, a mutation implies some change in these genes which alters their effect on the development of offspring, and thus brings about individuals differing, in some respects from their parents. As this word "mutation" has been given different interpretations at different times by biologists, Dobzhansky (1941) has proposed a definition more appropriate to discussions such as the present one and which will be employed here. He says, "A mutation is, then, a change in one of the units which are at present known as genes . . .

1. Contribution No. 78 from the Plant Protection Division, Science Service, Department of Agriculture, Ottawa, Ont.

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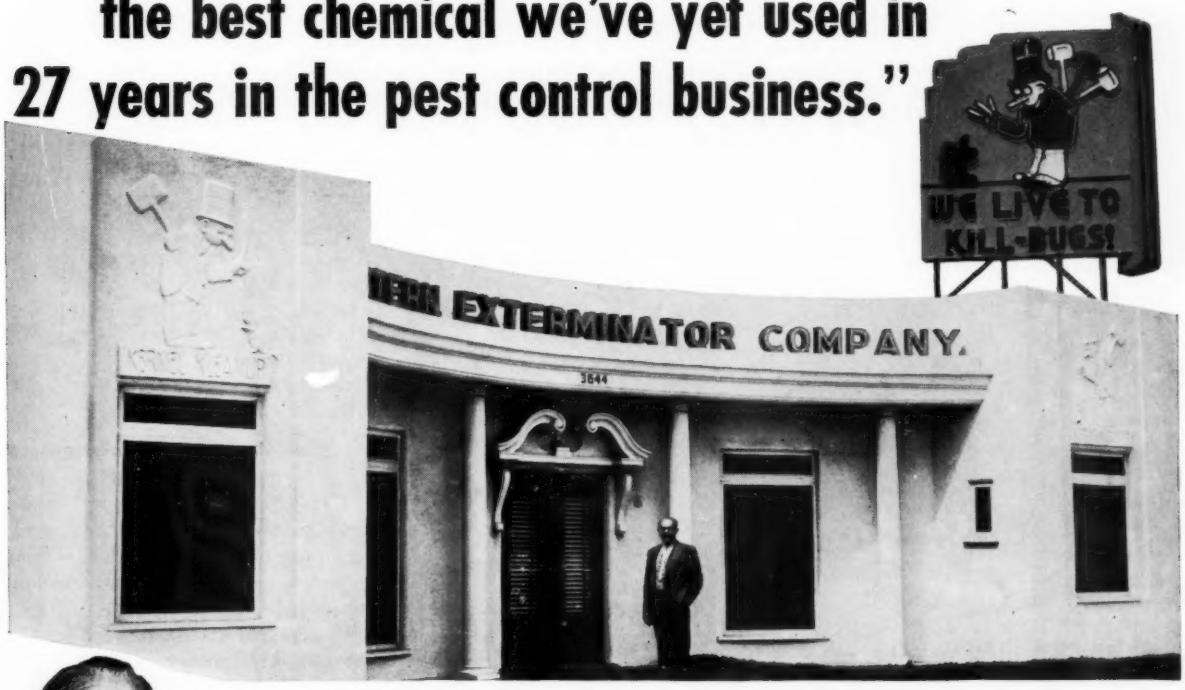

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In the narrower sense, it is a presumed change in a single gene, a Mendelian variant which is known to represent a chromosomal aberration. Unless otherwise specified, the term will be used in the latter sense".

*Individual adaptation*: The ability of an individual organism to make adaptations to suit certain environmental conditions must not be confused with an evolutionary trend in a whole population. If this phenomenon is always considered as an "individual adaptation," the essential difference can be kept in mind. Insects have often shown the ability to make structural or physiological modifications in response to the environment. A most striking example is afforded by the observations of Uvarov (1928), and Uvarov and Thomas (1942), on the phases of the migratory locusts. What were originally considered to be different species of locusts, were shown to be phases of the same species which had developed certain modifications according to whether the individuals were solitary or congregated together in a gregarious condition, with the potentiality to swarm. These two phases could be produced under experimental conditions by varying the density of the crowding of the nymphs, called "hoppers," in breeding cages. Subsequently, it was shown that in one species, *Locusta migratoria* (L.), the shape of the pronotum differed markedly in the two phases *solitaria* and *gregaria*, and it was clearly demonstrated that this was due to variations in the activity of the muscles attached to this structure, occasioned by the different movements of the body in the two environments, solitary or crowded. To quote these authors, "Thus, the phenomenon of individual phase change in the locust pronotum may be regarded as a striking example of a morphological response of a growing organism to a modification of behavior caused by environmental factors."

It must be emphasized that in this, as in all cases of adaptation, the potentiality to adapt is obviously hereditary and is transmitted from one generation to another, although the individual adaptations themselves are not handed on.

Under "individual adaptation" is included one particular type of insect resistance to chemicals. An example is the so-called protective stupefaction imparted to some species of insects but not to others by such agents as hydrocyanic acid gas, whereby a sub-lethal dose, first applied temporarily, stuns the insect, which is then incapable of taking up a fully lethal dose given afterwards. This phenomenon is probably only one aspect of a broader system of mechanisms whereby insects can be conditioned to a given chemical. McGovran, Sullivan, and Phillips (1939) showed that houseflies temporarily knocked down with sprays low in pyrethrum content were subsequently more resistant to sprays high in pyrethrum content than were test lots of normal flies not previously exposed to the first sub-lethal treatment. The possibility of individual conditioning is a most important consideration in appraising claims of increased resistance to insecticides in places or under conditions where the toxicants have been lightly or imperfectly applied.

### Resistance to Non-Chemical Factors

RESISTANCE to chemicals or other agents artificially introduced into the environment is obviously only one type of resistance exhibited by animal populations. There are, of course, other adverse factors which tend to keep a population down, or to confine it geographically. The most familiar ones are climate, diseases, natural enemies, and the resistance of plant and animal hosts themselves. In discussions of insecticide resistance these other factors are liable to be overlooked, and it must be emphasized that variants resistant to chemicals may not be able to contend so well with other adverse conditions.

### Mechanics of Resistance to Chemicals

The actual mechanics of resistance may be one or more of three factors: (1) lower intake of the poison; (2) greater tolerance to the poison once introduced; (3) a repellent effect of the chemical upon the insect.

Lower intake, of a contact insecticide, might be the result of some variation in the external structure of the insect such as a thicker body wall or longer protective hairs on the pads between the tarsal claws. With stomach poisons it might be due to a difference in the amounts actually passing through the walls of the alimentary canal and thus assimilated by the insect. Degrees of tolerance would involve some detoxification mechanism once the poison had begun its action upon one or more of the vital systems of the body. The repellent effect would cause insects to make efforts to avoid eating or coming in contact with the poison.

### How Resistant Populations Might Develop

*Theories of evolution*: Some mention of two of the theories explaining the process of evolution is necessary in the exposition of this subject.

Lamarck attempted to explain development along certain evolutionary lines by suggesting that characteristics acquired through the influence of the environment on the body during one generation could be handed on to the next. A familiar example often used to explain this theory is the increase in the length of the neck of the giraffe, presumably developed as the result of the effort of successive generations to reach the leaves near the top of the acacia trees on which this animal feeds. Acceptance of this theory would involve admitting that the "individual adaptations" previously described could be handed down to succeeding generations.

Darwin's more acceptable explanation, the law of natural selection, actually made before Mendel and others had demonstrated the mechanism of heredity, is still the basis, in modified form of the working hypothesis accepted by most modern biologists, especially those not laboring under ideological influences. Expressed in terms of modern knowledge and terminology, it claims that genetic variations, already present in some members of the population, or arising in some instances by mu-

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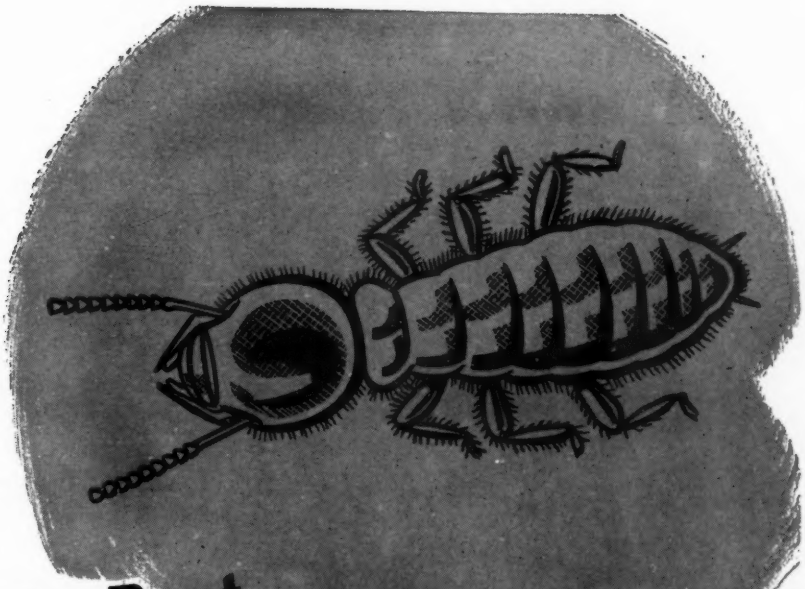

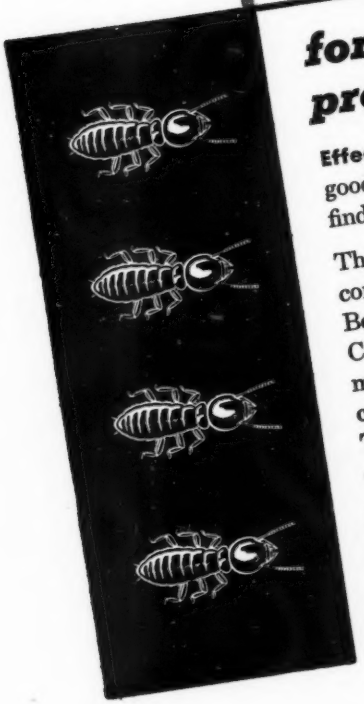

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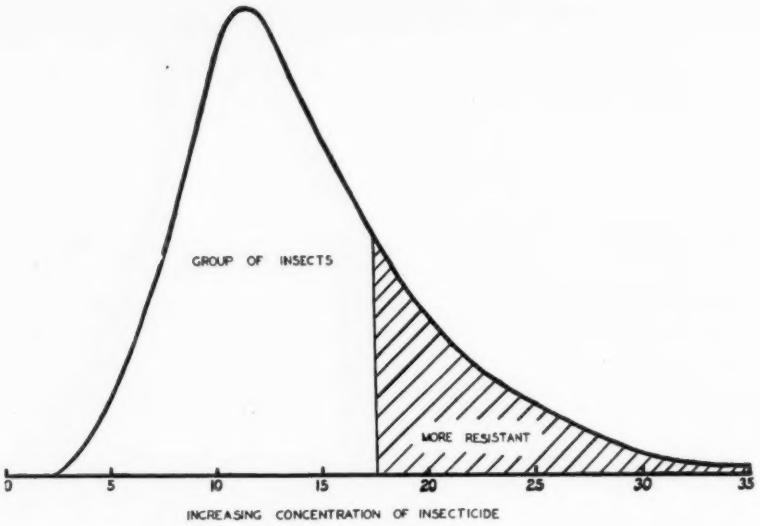


Figure. 1. Typical distribution curve showing the relative proportions of a group or population of insects resistant to increasing concentrations of an insecticide. The area between any two concentration values represents the proportion of inects having individual tolerances lying between these limits. For instance the area between concentrations 17-35 represents the smaller proportion of "more resistant" individuals. (Adapted from D. J. Finney, "Probit Analysis," Cambridge University Press, 1947).

tations, represent random alterations in the structure, physiology, or habits of individuals. These alterations, if adjusted to the environmental conditions, would tend to favor the individuals possessing them, who would increase their numbers at the expense of the rest, and thus bring about, sooner or later a change in the general composition of the population, making it more suited to the particular conditions under which it is striving to exist. This selective processes could, of course, also cause the final rejection of those types of individuals with unfavorable variations. The three steps involved in this process, namely, (1) the appearance of variations, (2) this testing and selection, and (3) possible subsequent isolation in a group of individuals, give an adequate explanation not only of the origin of plant and animal species but also of the mode of appearance of strains resistant to insecticides. The insecticide acts as a selective medium, by repeatedly allowing the survival and reproduction of resistant individuals in successive generations, encouraging the establishment of an increasingly greater proportion of them in each generation until finally the resistant type constitutes the great majority and is then representative of the population as a whole.

*Inherent Resistance*: Exposures of batches of test animals from the same population, under uniform conditions, to increasing concentrations of doses of a given chemical and subsequent calculations of percentage mortality yields data which, if plotted graphically with percentage mortality on one axis and dose on the other, give the sigmoid curve (Figs. 1 and 2) familiar to all who read articles dealing with insecticidal toxicity.

Both the sigmoid curve and the distribution curve illustrated demonstrate very forcibly the fact that in a given group of animals some individuals are more resistant than others, the majority, or norm of the population, is intermediate in resistance. and a few individuals are highly susceptible (Fig. 1). These individual differences in resistance may be brought about by factors in the history of the individual, such as environment and nutrition, or they may be due to differences in genetic constitution which make some intrinsically more resistant than others. The survivors from exposure to the higher concentrations can be retained and used for breeding progeny which in turn may be subjected to the same type of treatment, the survivors being used for breeding once again.

If, after this process is repeated a number of times, a population is produced which is, as a whole, significantly more resistant to the chemical than the original, it may be inferred that a resistant strain has been produced. This strongly suggests that in the original group individual genetic variations, representing favorable mutations, were present which permitted the breeding and isolation of a resistant strain. The best way to demonstrate the presence of such genetic factors is to cross the resistant with the non-resistant strains and test for the segregation of resistance from susceptibility in the second-generation hybrids. Such segregation clearly indicates that hereditary variables are involved.

An interesting study in failure to develop resistance to climate was made by Bucher Cameron and Wilkes on the resistance of laboratory-reared puparia of the housefly, *Musca domestica* (L.), to low temperatures. A large population of 70,000 puparia was stored at 6° C. for 15 days. The surviving adults, numbering about 1%, were used for breeding, and the puparia produced were again stored under similar conditions. This procedure was repeated for seven generations, but this selection failed completely to increase the resistance of the resulting population of puparia to cold storage.

*Mutant resistance*: While the appearance of resistant strains is probably due to mutations

*(Continued on page 42)*

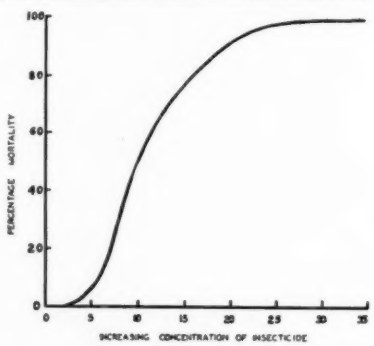


Figure 2. Sigmoid curve which can be derived from the distribution curve in Figure 1. In this curve the percentage of the insects in the group which succumbed to the insecticide are plotted against the particular concentrations producing this effect. (Adapted from D. J. Finney, "Probit Analysis," Cambridge University Press, 1947).

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BY

**DR. R. C. ROARK**

**U. S. Department of Agriculture**

*Copies of all patents can be obtained for 25 cents (no postage) sent to the Patent Office, Washington, D. C. In ordering a copy of a patent the number of the patent, the date, the name of the patentee, and the subject of the invention should be stated.*

**2,462,479** (Feb. 22, 1949; appl. June 17, 1946). RAT OR MOUSE TRAP. Eugene H. Elleby, Atlanta, Ga.

**2,462,654** (Feb. 22, 1949; appl. June 15, 1946). TRIFLUOROMETHYL-HEXACHLOROCYCLOHEXANE Earl T. McBee, LaFayette, and Lavon D. Bechtol, Indianapolis, Ind. — Purdue Research Foundation, West Lafayette, Ind.—Trifluoromethylhexachlorocyclohexane is useful as an insecticide.

**2,462,689** (Feb. 22, 1949; appl. Aug. 3, 1944) INSECTICIDE DISPENSING DEVICE. Ernest A. Stretz, Compton, Calif. This device is adapted to be attached to the harness or collar of an animal, such as a dog or cat.

**2,462,835** (Mar. 1, 1949: appl. Sept. 3, 1943). FLY SPRAY. Harold W. Arnold and Norman E. Searle, Wilmington, Del. — E. I. du Pont de Nemours & Co., Wilmington, Del. — A fly spray composition comprises a solution of pyrethrum and an N-alkyl malemide containing less than 16 carbon atoms, said pyrethrum being present in about 5 to about 95 milligrams per 100 cc. and said imide being present in the amount of at least about 10(100-P) milligrams per 100 cc. where P is the amount of pyrethrum in milligrams per 100 cc. of the fly spray.

**2,463,246** (Mar. 1, 1949; appl. July 17, 1946). CLOSURE OPERATED DEODORIZER. Harold Jack Cohn, Chicago, Ill. — This deodorizing or disinfecting device is operable by the opening or closing movements of a door.

**2,463,653** (March 8, 1949; appl. June 27,1945). PRODUCTION OF DDT OF IMPROVED QUALITY. Michael Sveda, Cleveland, Ohio — E. I. du Pont de Nemours & Co., Wilmington, Del. — The patentee claims in a process of producing DDT having a set point higher than about 90° C. the steps comprising sulfonating, with sulfuric acid having a strength of from 99 to 104.5% $H_2SO_4$ and at a temperature of about from 15 to 40° C., at least a part of the ortho, para isomer present in a mixture comprising ortho, para and para, para isomers of DDT and washing out the sulfonated material from the para, para isomer with water.

**2,463,839** (Mar. 8, 1949; appl. May 15, 1947). MOUSE AND RAT TRAP. Tom Wilson, Lake Village, Ark.

**2,463,879** (Mar. 8, 1949; appl. Mar. 11, 1946). TRIGGER FOR MOUSE-TRAPS. Oliver Warren Johnson, Geneva, Ohio.

**2,464,043** (Mar. 8, 1949; appl. July 21, 1945). AIR-DEODORIZING COMPOSITIONS. Jonas Kamlet, New York, N. Y. — Bolle-Midway Inc., New York, N. Y.—An air-deodorizing composition in the form of a solid form-stable mass contains homogeneously blended about 235 parts by weight of trioxane, about 235 parts by weight of paraformaldehyde, about 5 parts by weight of zinc chloride dissolved in about 5 parts by weight of water and about 200 parts by weight of a perfuming agent.

**2,465,470** (Mar. 29, 1949; appl. Jan. 11, 1947). INSECT REPELLENT STICK. Allen L. Omohundro, Wilton, and Franz M. Neumeier, Fairfield, Conn., and Benjamin R. Zeitlin, Bronx, N.Y. —McKesson & Robbins, Inc., Bridgeport, Conn. — An insect repelling solid alcoholic soap gel stick contains for its active ingredient from 20% to 50% by weight of o-dimethyl phthalate and 2-ethyl-1,3 hexanediol, the proportion of each of said substances within the percentage range of the active ingredient varying from zero to 100%, alcohol in an amount from 9% to about 30%, the alcohol serving as a solvent for the active ingredient, soap in an amount to solidify the composition, and water in an amount of about 3% to 4%.

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# EXTRACT from Experiment Station Reports

By PAUL HERBERT

### Mosquitoes

Entomologists at the Delaware Agricultural Experiment Station, Newark, Dela., have developed a new technique for control of mosquitoes around seaside bathing beaches and summer resorts. Tests were made to determine if a selected point could be effectively protected from invasion of *Aedes* mosquitoes by restricting the movement of these migratory species with DDT sprays.

Two barrier zones in the vicinity of the resort, each one-half mile in width, were sprayed from a plane periodically with the toxicant, at the rate of 0.2 pounds per acre, this dosage being considered non-injurious to wild life.

Maintenance of this sizeable defensive block across the line of normal mosquito flight completely eliminated annoyance by these pests, a progress report in the Delaware station's annual report for 1948 states. There were but two nights in July and four nights in September in which 24 or more female *Aedes* were recorded, this figure being established as the nuisance factor. Prevalence of this species was reduced 98 per cent as compared with conditions beyond the barrier zones, the report states.

### Poison Ivy

PCOs who might be called on to destroy a plot of poison ivy will be interested in tests made at the New Hamshire Agricultural Experiment Station, Durham, N. H., to compare the effectiveness of the herbicide, 2,4-D, with better known chemicals for killing poison ivy.

Borax, when used at 4 lbs. per 100 sq. ft. and Ammate, at ¾ lb. per gallon of water per 100 sq. ft., gave complete kills. A methyl ester of 2,4-D at 1,000 parts per million of water was entirely effective only after a second application and an ammonium salt of 2,4-D at 1,000 ppm. was considered less satisfactory than the methyl ester.

Several other available herbicides containing 2,4-D were also compared with each other and the most effective was the butyl ester, which, in one application, destroyed nearly all the poison ivy in the area treated and was not greatly inferior to the Ammate.

"In view of the fact" says a brief report in the New Hampshire station's annual report, "that most initial treatments of poison ivy with Ammate and borax requires follow-up applications of herbicide, it may well prove as effective in the long run to use the 2,4-D esters, as to use the slightly more dependable Ammate and borax."

### Dutch Elm Disease

Rhode Island Agricultural Experiment Station, Kingston, R. I., announced in its report of 1948 activities, released last May, a new technique for control of Dutch elm disease. Laboratory experiments with the fungus causing this disease had proved that if the medium in which the fungus was cultivated is kept basic (pH 7 and above) the fungus does not readily produce the toxic substances which injure living tree cells.

Likewise the toxin is made innocuous in solutions containing free hydroxyl ions. Previously it had been noted that elm trees were predisposed to suffer more severe injury from the disease when they were growing in soils with a high hydrogen ion content.

Continuing, the report says: "The data indicate that treating the soil about the roots of elms with certain basic chemicals (not named in the report) retards toxin production of the fungus, so that damage to the tree is slight or nil. Since adjusting the hydrogen-ion content of the soil is not the complete answer, chemotheraputants are being developed to help the tree resist the disease or to inactivate the toxin produced by the invading organism."

Rhode Island investigators also developed a "speed-up" method for evaluating treatments in the greenhouse on 1- or 2-year-old seedling elm trees in connection with efforts to condition trees against the Dutch elm disease.

A laboratory study had revealed a correlation between the sugar content of some plants and their likelihood of injury by some fungi. Healthy young elm trees do not readily succumb to invasion by the Dutch elm disease fungus, but it was discovered that by keeping the seedlings in the dark for five days, their food reserves would become depleted and they could be readily injured after innoculation. Control measures, the reports points out, "can now be developed with a saving of years of time and acres of trees."

### Arborvitae Weevil

Nurserymen will be interested in the Rhode Island station's announcement that a full report will be issued in the near future on the biology and control of a new economic pest of nursery stock, the arborvitae weevil, which was first discovered in Rhode Island in 1947. The insect, it has been concluded, is a native of Honshu, the main island of Japan. A brief note in the annual report says the adult has been controlled with as little as ½ pound wettable 50 percent DDT in 100 gallons of water, sprayed onto the foliage when the weevils are emerging from the soil in May. If the adults are controlled before eggs are laid, it was shown, it is not necessary to treat the soil for control of the larvae.

---

### DDT for Peach Tree Borer

Roy W. Rings, entomologist at the Ohio Agricultural Experiment Station, reports that peach tree borers can be controlled by timely sprays with DDT at the rate of 4 pounds of 50% DDT wettable powder in 100 gallons of water (2½ level tablespoons of DDT in 1 gallon of water). Sprays should be applied to get the adult moth or newly hatched larvae and then followed by two additional sprays at 20-day intervals. Apply the spray thoroughly to the trunks, from the base up 18 inches, in sufficient quantities so that some run-off will accumulate around the base of the tree.

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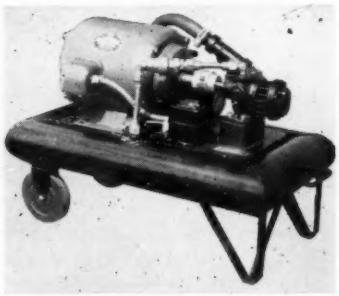

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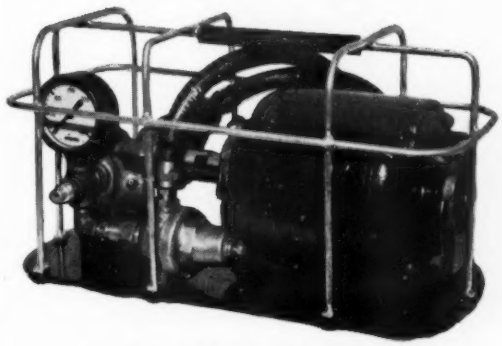

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Robert B. Mesecher

# *A Century of Pest Control*


Guest Editorial by

**Robert B. Mesecher**

Chairman, 17th Annual NPCA Convention Committee


CALIFORNIA is indeed grateful in having the honor of playing host to the National Pest Control Convention this year. That such good fortune should come to us in 1949 is of special significance in that just one century ago, in 1849, the early settlers of this State voted that California should become one of the United States of America.

1849 also stands vivid in our history because it was in this year that the gold rush started a migration of thousands to California to seek their fortunes. Every state in the Union, Canada, and many other sections of the world contributed pioneers to enrich our heritage. This was the birth of a new era for California and the finale of the romantic period of California history which was the era of the Dons, the great land owners whose Castilian hospitality was a by-word.

Travel a century ago was slow and arduous and the pioneers brought with them only the bare necessities for their existence. They also brought a rich supply of new ideas. These, coupled with ideas furnished by those of later migrations, have played a large role in developing California into one of the truly great States of the Union.

Using California's past century of history as a background, the Convention Committee has endeavored to constitute a program that would promote the exchange of ideas to the highest degree possible. In keeping with the spirit of the occasion the Committee has chosen "A Century of Pest Control" as its theme.

The Convention program has a wide range and is designed to have something of interest at all times for all registrants regardless of their particular branch of pest control. Because of the increased activity of the NPCA Termite Committee this past year, we felt it was imperative to allot a considerable amount of program time to termite control. We also realized there are sections of the country where termite control is of little importance and that large numbers of PCOs from other secitons who do not practice termite control will be in attendance. There was but one course of action and that was to run two programs concurrently the greater part of the time.

All available booth space has been sold and the exhibitors promise a real display of the very latest in pest control equipment and insecticides.

For the pleasure of our visitors, the Entertainment Committee is arranging a program that should gladden the hearts of young and old alike, and the Ladies program will include tours of Hollywood, Beverly Hills, the Beaches, Orange and Avacado packing plants, Old California Mission and some of the better shopping districts.

To the visitor, Los Angeles and vicinity offers much in sights of interest. The beach towns with their amusement piers and beaches; the Los Angeles harbor district with its bustle of commerce; Hollywood Bowl, the great natural outdoor theatre made famous for its "Symphony under the Stars"; Knott's Berry Farm famous for its southern fried chicken and boysenberry delicacies as well as its colorful "Ghost Town" replica of a true gold rush town of old; Pasadena's famed Rose Bowl, where annually on New Year's day the nation's top teams meet; Griffith Park with its Planetarium and 3,752 acre recreational playground; Santa Catalina Island, famous for its glass bottom boats and marine gardens, Avalon Bay and Bird Farm; Los Angeles Memorial Coliseum where the Pacific Coast Conference teams play regularly; Santa Anita famed for its racing and beautiful setting; Padua Hills, where the romance and beauty of early California and the charm of Mexico are brought together; Motion Picture Studios where the greater per cent of the movies are made; Hollywood Boulevard, where the movie stars shop and the famous corner of Hollywood and Vine where elbows can be rubbed with movie stars; Grauman's Chinese Theatre famous for its imprints in the concrete in front of the theatre; Radio Studios" on famous Sunset Blvd., along with Earl Carrol's glamorous night club; Olvera Street, the first street in Los Angeles, now a genuine Mexican street market; China City, complete community with shops and eating places; Huntington Library, repository of art treasures and original manuscripts and rare books. This is but a portion of what Los Angeles and vicinity has to offer its visitors.

Confident that we have a program that will be of real interest and value to all members of the Pest Control Industry, it is indeed a great pleasure to extend this cordial invitation to all members of the industry to attend the NPCA Seventeenth Annual Convention, to be held October 17-18-19, Biltmore Hotel, Los Angeles, California.

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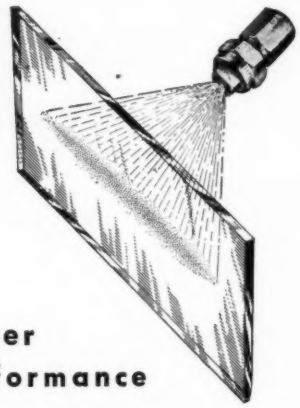

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# PC NEWS

## Redd Speaks to Freezers

J. C. Redd, president of Redd Pest Control Co. in Jackson Mississippi, spoke to the members of the Frozen Food Lockers Association during their annual meeting in Biloxi, Miss., August 8 and 9. His subject was, "What Can Happen to Your Plant — Effective Insecticides and Control." Redd, who is one of the NPCA directors, is also president of the Mississippi Pest Control Association.

This speaking engagement is the sixth of its kind filled by Redd this year. He spoke to the entomology students at State College, Miss., on two occasions, has a regular schedule to teach the pest control part of the Miss. Public Health Training School each quarter and was invited to discuss the subject of "Practical Pest Control for the Flour Industry" at the meeting of the Southern Selfrising Flour Institute which met in Jackson last April.

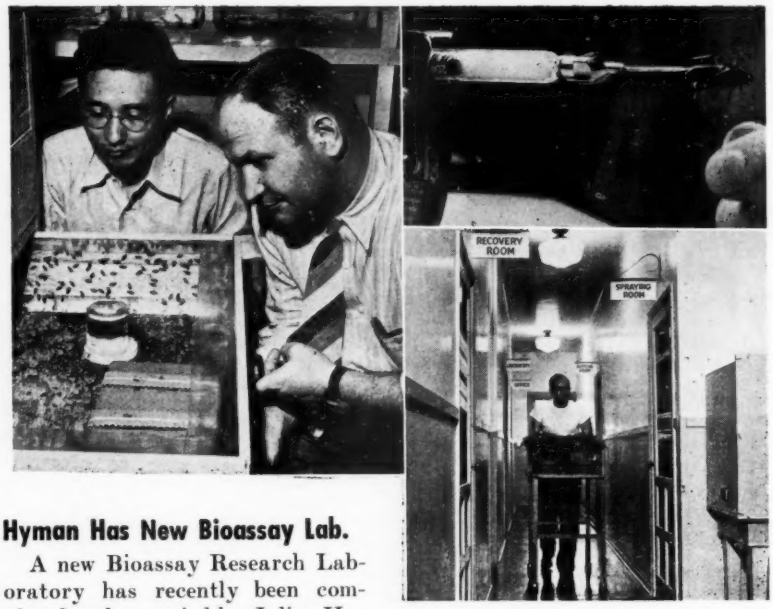
## Livingston Forms Co.

Arnold M. Livingston, formerly with S. B. Penick & Co. as a technical sales representative, has left to form his own company. Called the Chemical Insecticide Co., at 285 Van Brunt Street, Brooklyn 31, New York, Livingston's business will supply DDT, Chlordane, Toxaphene, Pyrethrum, BHC and other insecticides as well as special compounds for fogging operations.

The June, 1949 issue of *Public Works* carries an interesting article entitled, "Insect Control with Mechanical Equipment," of which Livingston is the author.

## Golden Year for the Howells

Mr. and Mrs. T. J. Howell, parents of Jerry L. Howell who steers the Howell Termite Company in Houston, Texas, celebrated their 50th anniversary on August 3rd with an open-house party.




LEFT: Dr. Y. P. Sun, entomologist and director of Hyman Bioassay lab, and W. E. McCauley, entomologist, examing drawer where roaches are reared. TOP RIGHT: Micro-injection test on German roach. BOTTOM RIGHT: Lab. assistant wheeling plants down corridor in Bioassay lab.

## Hyman Has New Bioassay Lab.

A new Bioassay Research Laboratory has recently been completed and occupied by Julius Hyman & Company, manufacturers of Chlordane, Denver, Colorado. Designed to include both developmental and control work on insecticides for agricultural, household and industrial use, it is said to be one of the most modern and well-equipped laboratories of its kind in the country.

A technical staff including eight entomologists, chemists, and assistants, work under the direction of Dr. Y. P. Sun, entomologist and head of the laboratory.

Controlled temperature rooms and an attached greenhouse where plants are grown under artifical light, permit the growing of plants and insects for testing throughout the year. A specialized system of air-conditioning is used to prevent contamination of materials and insects under test, and insure uniformity in both cultural and testing procedure.

The building comprises eight rooms and has approximately 2,800 square feet of floor space. It is the center of activity for: (1) Screening new compounds developed in the company's Research Laboratory (2) Routine testing of Chlordane for the purpose of maintaining a high standard (3) Guiding research and production for the development and manufacture of better quality insecticides and (4) Testing customer's Chlordane formulations for effectiveness of insect kill.

In this laboratory are rearing rooms where the pedigreed pests of the insect world are bred under conditions of controlled temperature and humidity and fed on a special diet to assure maximum vitality. Among the insects reared in the laboratory are: Houseflies, German Roaches, Milkweed Bugs, Pea Aphids, Mexican Bean Beetles, Confused Flour Beetles and Carpet Beetles.

The equipment includes specially designed apparatus for testing such as a small chamber spray machine notable for ease and speed with which it can be cleaned and which eliminates contamination possibilities that often throw doubt on the validity of test results. There is micro-injection equipment for testing minute quantities of insecticides in the body of insects and which make possible the unit of dosage, 1 cubic millimeter or 0.001 or a cubic centimeter. There are settling towers for testing sprays and dusts and a turn-table for the same purpose which in addition to the main table contains six small ones revolving around the center.

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## Acmeline Management Changes

Acmeline Manufacturing Co., manufacturers of sprayers and dusters in Traverse City, Michigan, recently announced important changes in management personnel. G. G. Carpenter becomes general manager and H. H. Rowe has been made general sales manager. The new Board of Directors consists of Senator James T. Milliken, Dr. John G. Milliken, William G. Milliken, and the two newly appointed company officers.

Both Rowe and Carpenter have been associated with the Dobbins Manufacturing Co. for the past ten years. Previous to that time Rowe was associated with the Lowell Manufacturing Co., and Carpenter with Lindsay Bros. Co. of Minneapolis.

It is reported extensive plans have been made for expanding sales and production of sprayers, dusters and hand planters, products Acmeline introduced to the trade over 75 years ago.

Herbert P. Boughey, recently holding the position of acting general manager, has been appointed sales representative for the central states.

## MGK Appoints Reeks

Lloyd D. Reeks, Jr. has been appointed company representative to cover California and Arizona for McLaughlin Gormley King Co. according to an announcement by the insecticide manufacturer.

Following his service with the Army Air Force, Reeks was associated with the Wilson & Geo. Meyer & Co. in Los Angeles. His headquarters for McLaughlin Gormley King will be in La Canada, California.

## Trade Names for 118, 497

Julius Hyman & Co.. Denver, Colorado, has announced that its two new insect toxicants, previously identified as Compounds 118 and 497, have been given trade names. Compound 118 will now be known as "Octalene" and Compound 497 as "Octalox." Both of these chemicals, now widely used in the United States and abroad, are being tested at approximately sixty Federal experiment stations and many state experiment stations as well as those in Hawaii and Puerto Rico. Hyman expects to be in commercial production of these new chemicals for the 1950 season.

Data sheets giving comprehensive information about the physical and chemical properties and the insecticidal activity of Octalene and Octalox are available from the company upon request.

## Kerosene Caution Statement

The Association of Economic Poisons Control Officials' committee on toxicity and antidotes has recommended the following "caution statement" on all kerosene type household sprays: "Caution — Harmful if swallowed. Keep out of reach of children."

## 1950 NSDA Officers

At the recent meeting of the National Sprayer & Duster Association held at the Edgewater Beach Hotel in Chicago officers for the coming year were elected. Chosen were: President, C. D. Leiter, general sales manager of F. E. Myers & Bro. Co.; Vice President, Ralph B. Chapin, President of R. E. Chapin Mfg. Works, Inc.; and D. P. Lewis of H. D. Hudson Mfg. Co., who was re-elected Treasurer. Frank J. Zink and Earl D. Anderson of Frank J. Zink Associates, Chicago, were re-elected as Counsel and Secretary, respectively, of the Association. Elected to the Executive Board, in addition to the newly picked officers were: T. M. Burton, D. B. Smith & Co.; P. L. Hauser, Lowell Mfg. Co.; H. F. Brandt, Dobbins Mfg. Co.; and R. C. Hudson, H. D. Hudson Mfg. Co. Mr. Hudson, president of the sprayer company bearing his name, served as president of the NSDA during this past year.

## Felton's Southern Reps.

James Leonard has been appointed to serve as representative in Texas and western Louisiana for the Felton Chemical Company, manufacturers of essential oils and aromatic chemicals, Brooklyn, New York. Leonard will make his headquarters at 1207 South Industrial Street, Dallas, where stocks of the company's products will be carried.

David Marso has been transferred from the company's home office to Atlanta, Ga., where he will cover the southeastern states. Leo C. Weinrobe will continue to service Missouri, Kansas, Oklahoma and Arkansas from headquarters in St. Louis.

## Loss to Andrews Extg.

Miss Margaret Anderson who, since the organization and incorporation of the Andrews Exterminating Co. in Kansas City, Mo., has been vice-president and office secretary of the company, died on August 4th. Miss Anderson was a member of the National Pest Control Association.

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The handy Vibro-Sprayer is just right for home-owners and operators of tourist camps, restaurants, taverns, small stores, apartment buildings, etc. Urge them to buy the electric Vibro-Sprayer to control pests. There's a big profit on your sale of the sprayer—afterwards you sell your own liquid mixtures for added profit.

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No air pressure required. Molded phenolic pump housing. 25 oz. Mason jar type paint container. 8' extension cord. Operates on 110-125 volts, 50-60 cycle, A.C. only. Dimensions: 8⅜" high, 6¼" deep, 4" wide. Weight: Unpacked, 2½ lbs. In single carton, 3¼ lbs. Packed 6 per shipper, 20 lbs.

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| 2 to 5 | 8.65 | 12.95 | 4.30 each |
| 6 to 23 | 7.80 | 12.95 | 5.15 each |
| 24 to 47 | 7.15 | 12.95 | 5.80 each |
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**PCE Plastic Pints**

**Won't break, chip, burst, or soften. Can be used for mouse seeds and deodorizing liquids; are ideal for Chlordane, DDT, 1080, commonly used poisons and emulsion concentrates. Pints only, complete with handsome black plastic cap.**
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**Prices**

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| 5,000 to 20,000 | 2.25 |
| 5,000 | 2.50 |
| Less than 5,000 | 3.00 |

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**Pioneers in the use of chlorinated phenols for termite control.**
**Broad St. at Union R. R. Box 5218 Memphis (12) Tennessee**

Harry H. Bauman

## Bauman Joins Commonwealth

Harry H. Bauman has been named manager of the Youngstown, Ohio, branch of Commonwealth Sanitation Company, according to L. L. Crosby, president of the firm with headquarters in Pittsburgh, Pa.

After his graduation in 1934 from Ohio University with a degree in entomology and biology, Bauman took post-graduate work in entomology at Ohio State University and attended the graduate college at Akron University. From 1942 to 1945, he served in the Army Medical Corps.

In addition to his administrative duties at the Youngstown office, Bauman will assist Dr. Robert E. Evans, head entomologist for Commonwealth and associate companies, in the direction of the firm's research laboratories and activities. Commonwealth has 13 branch offices in principle cities.

## Beware of the Faucet

Drinking from a faucet which has been connected with a spray gun operated by water pressure may cause death or serious illness, warns Los Angeles city health officer, George M. Uhl.

One death has occurred in that city because a poisonous weed killer was sucked into the water line for lack of a back-flow value in the spray gun, Dr. Uhl said.

## New Insect Box

Transparent plastic boxes which PCOs may find handy for keeping insects and other specimens protected and orderly, are now available in a number of sizes from Bradley Industries, 1652 N. Damen Ave., Chicago, 47, Ill.

These boxes, reported to have tightfitting covers, are dustproof and moisture proof and should make reference easy. They are economically priced according to the size desired.

## Hydrazine for Testing

Hydrazine in anhydrous form and small quantities of hydrazine sulfate are now being produced by Mathieson Chemical Corporation, reports Thomas S. Nichols, president. Limited amounts are being supplied to commercial interests for test purposes.

Many potential commercial uses are being investigated, Nichols said, and patents already issued suggest that the products may find application in the manufacture of insecticides.


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Write us about your problem and we will be glad to give you our recommendations.

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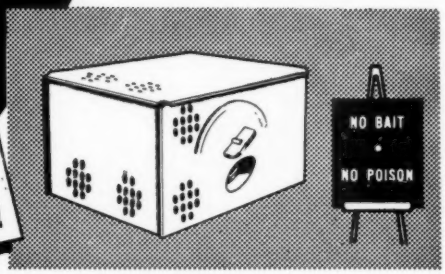


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**No Bait — No Poison**
**Catches 15-20 Mice with One Setting.**
**Safe — Sanitary — Effective**
**Minimizes Chance of Rodent Hair Contamination.**

Economize with the best, specify KETCH-ALL traps. The modern effective trap. Special PCO trade price $32.00 doz. prepaid. Retail $4.50 each.

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Spraying Systems Co. nozzles for the PCO at factory-established low prices. Tell us your purpose and we'll advise the best nozzle to use.

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PCE's lightweight strong aluminum extensions are available from 18" to 6 ft. in multiples of 1½ ft. Fitted with our own exclusive special fittings for leakproof attachment WITHOUT THE USE OF TOOLS.

**CASES**
Handsome, sturdy, economical • Varnished hard fibre • Steel frame • Metal bound corners • Handy accessory carrying loops • Strong • Light-weight • Steel reinforced shelves.
Only $10.75 each, net. Also available for round tank-type sprayers, at $12.50 each, net.
PCE will make any case to your specifications. Write for details.

Write for further information and prices on these and other items in PCE's complete line. There's no obligation of course.

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# Red Squill Is Subject of First Purdue Research Fellowship

The establishment of a 12-month research fellowship, sponsored by the Purdue Pest Control Operators Research Fund has been announced by J. J. Davis, Head of the Entomology Department of Purdue University. Harlan R. Shuyler, Purdue graduate of June, 1949, has been selected as the first recipient of the fellowship.

The project, which has been approved by the Purdue Research Project Committee, is entitled, "The Development of an Acceptable Red Squill Poisoned Bait for Practical Rodent Control." The investigation is original and much needed. It offers promise of results which will be of much value to all pest control operators.

Statements included in the "Problem" of the project reads as follows:

"The pest control industry, farmers, food handling and processing establishments, as well as home owners and tenants need a poisoned rodent bait that is safe (relatively non toxic) to humans and domestic animals, is useable in food establishments and yet is toxic to rats. Red Squill is widely employed in rodent baits because it is safe to use. It is relatively non-toxic to man and domestic animals and in addition, acts as an emetic to man and mammals other than rats. Red Squill is not, however, accepted readily by rodents due to qualities inherent in it as a natural plant product.

"To retain the advantage of safety in use and toxicity to rodents, and to increase red squill bait acceptability will make possible an increased efficiency of safe rodent control."

The objectives of the project are given as follows:

"1. To find the bait or baits available at the present time which, when poisoned with red squill, have the greatest acceptability to rodents.

"2. To find a material or materials which when added to red squill, to food baits, or to the two combined make red squill poisoned baits significantly more acceptable than those available at the present time.

"3. To determine the ecological conditions which effect the acceptability of red squill poisoned baits."

The study will be under the direction of Galen C. Oderkirk of the Fish and Wildlife Service and John V. Osmun of the Purdue University Department of Entomology.

Ideas and/or suggestions from pest control operators for the project will be greatly appreciated and may be sent to J. J. Davis.

*Editor's Note:* Harlan R. Shuyler, Purdue 1949, is the son of Reynold Shuyler, well known pest control operator of Kansas City, Kansas. He was the 1947 recipient of the P. C. O. scholastic award.

## Effect of DDT on Rats

In the May 27th issue of *Public Health Reports*, published by the Federal Security Agency, there is an article entitled, "Effects of DDT Dusting on Domestic Rats Under Colony and Field Conditions." Summarized, the article presents data, from a colony study and limited field collections of rats, which show that the distribution of 10 per cent DDT in pyrophyllite in domestic rat habitats resulted in pathological changes consistent with DDT poisoning and in the accumulation of appreciable quantities of DDT and DDA in the livers and fat of exposed rats. These results indicated that DDT dusting for the control of diseases of domestic rodents not only decreased fleas significantly but also affected rodent populations directly. In the treated colony, 32.7 per cent of the rat population apparently died from DDT poisoning within 7 weeks and 36.3 per cent within 11 weeks after the colony habitat was dusted. General field observation indicated that such rates are in excess of those to be expected under field conditions where rats can exercise greater freedom in avoiding unfavorable situations.

## Revision of DDT Regulations

Interpretation No. 16 of the labeling requirements for insecticides containing DDT, has been amended according to a recent announcement by the Insecticide Division of the Department of Agriculture. This regulation, which suggested the amount of the chemical to be used for mothproofing, is made to conform to the new recommendations against the use of DDT in dairy barns and on dairy cattle.

Paragraph (j) (2) of interpretation No. 16 provided originally for labeling of DDT products as mothproofing of wearing apparel and carpets which contained 1 percent of DDT. In its modified form the interpretation cuts this percentage in half to 0.5%.

Paragraph (k), relating to directions for use of DDT against insects infesting livestock, was changed only to exclude dairy animals from among the animals on which DDT is recommended for use to control insects. The interpretation says DDT should not be used on dairy animals or on forage to be fed dairy animals or animals being finished for slaughter, nor should it be used in dairy barns pending adequate tests which show that under the proposed conditions of use it will not cause contamination of milk.

## Put Skunks to Sleep

Five boys in Troy, Ohio came to the rescue when skunks took up residence in the home of one of the town's elderly ladies. First she had thought to shoot them, but dropped the idea when a neighbor explained that the animals could retaliate with an odor that would drive her from the house. The boys, who heard of the lady's plight over a local radio station, provided a simple solution. They put the skunks to sleep with ether and carried them away.

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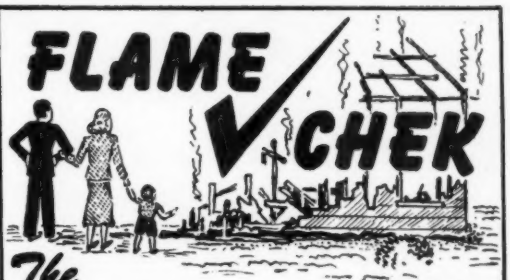

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**EASY TO HANDLE** Can be picked up without spilling contents.

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Distributors for Universal Paper Products Co., at factory established prices.

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| 1M to 5M | $6.75 per M. |
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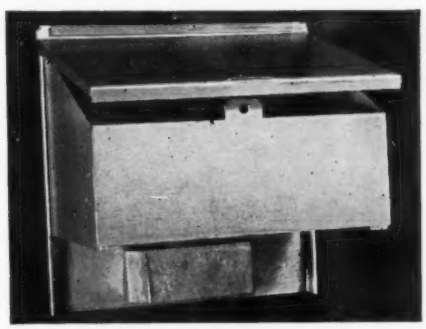

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# NPCA CONVENTION NEWS

## Topics to be Discussed at NPCA Convention Announced

Just at press time, *Pest Control* was able to obtain a tentative program for the 17th Annual Convention of the National Pest Control Association to be held at the Biltmore Hotel in Los Angeles, California, October 17, 18, 19.

As reported earlier, the program is to be divided into two concurrent sessions with one meeting on termites and the other on general pest control problems, both to be followed by general meetings to review the pertinent points brought out in the separate discussions.

### Reserve Room Through Brooklyn

Convention-goers planning to stay at the Biltmore Hotel, convention headquarters, during the meeting are urged to make their room reservations through the office of the National Pest Control Association at 3019 Fort Hamilton Parkway, Brooklyn 18, New York. The hotel has insisted upon this arrangement to secure the best possible accommodations for the delegates.

The termite program will feature the eagerly-awaited report of the NPCA Termite Committee with George L. Hockenyos, committee chairman, leading the discussion. Subterranean termite treating methods and business techniques of Southern California will include: importance of a written report, seal offs, below-grade foundation and ventilation factors and chemicals in a panel discussion lead by George Taubert, Ralph E. Oliver, Joseph A. Goulding, Wayne K. Davis, and Herbert R. Packard. J. Wilfred Gunn will preside at a general assembly meeting on wood destroying organisms featuring a report on drywood termite fumigation by Karl Hassler and one on the importance of the "stall shower" in termite inspection work by William Thomas.

Motion pictures on termites will be shown at another meeting at which D. C. Tracy will be chairman. W. H. McCain will talk on the business mechanics section of the NPCA Termite Committee and Clifford Hodel is to be chairman of another session including a discussion of the Los Angeles Minimum Code by Herbert Packard, Kenneth Scott, Karl Hassler and Ralph Oliver. Termite legislation in Florida, Louisiana, Alabama, Mississippi, Tennessee and California, important termite states, will be covered by Theodore Oser, A. S. Krawcheck, J. C. Redd, Walter B. Hill and J. Wilfred Gunn. Dr. Thomas E. Snyder, the country's leading termite authority, will address the group on highlights in termite control.

### "Blackouts" Blacked Out

In the August issue, *Pest Control* reported that delegates to the NPCA convention would see the "Blackouts" musical revue on Tuesday night, October 19th. We have been informed that sudden change in plans for the cast make it impossible to be in Los Angeles on that date, so another entertainment feature will take its place.

The general pest control sessions will hear talks on how to make a rodent survey by NPCA prexy, V. H. Montgomery, and another on how to use rodenticides, their toxicity and results to be expected by Edward W. Bushing. An open form on rodent control will be chairmaned by Elmer Lien and features Walter W. Dykstra, Howard B. Hollender, Kenneth C. Bell and Basil Gough. Household and yard ant control, the proper chemicals and equipment to use is to be covered by Dr. E. Gorton Linsley. An "ant" forum will include such speakers as Robert Loibl, Jr., W. E. McCauley, J. Harry Britt and James R. Daniels. Dr. R. L. Metcalf will give the latest report on the trends and future aspects of new insecticides.

Fumigation will also be covered by the general pest control group as well as discussions and questions on moths, carpet beetles, roaches, silverfish, stored products insects and laws and enforcement with Harold E. Jennings presiding. William O. Buettner, NPCA executive secretary, will be chairman of another session which will feature an address by Dr. S. A. Rohwer, assistant chief of the Bureau of Entomology & Plant Quarantine, USDA, on the overall insecticide situation. Walter W. Dykstra, rodent control expert, will discuss important factors in the control of house mice.

### Still Room on Special Train

There is still room on the special PCO-sight-seeing train to be run by the Santa-Fe railroad and stopping at Carlsbad Canyon, Grand Canyon and Phoenix on the way to Los Angeles. Full information can be obtained from Martin T. Meyer, 213 South 10th St., Philadelphia 7, Pa.

What happens to PCO gross dollar receipts, identification made easy, methods and gadgets which make PCO work easier and fly control will be included in special talks by Ray Lovejoy, Roy W. Hunt, Martin T. Meyer and Dr. R. B. March.

At this early date, it is still possible that some slight changes will be made in the subjects given above, but essentially the topics mentioned are to be included in a program valuable to any pest control man.

Registration fee for the NPCA-Los Angeles convention will be $17.50 and $2.50 for each of two luncheons per person. There is no charge to the ladies for the luncheons that are provided.

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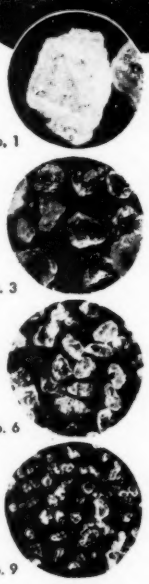


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**SIXTH AND SPRING, LOS ANGELES**

# ORGANIZATION NEWS...

Picture taken July 15th following organization of Oregon Pest Control Association in Portland. Elbo-benders shown are: *(from left to right)* Charles P. Brewer, Brewer's Pest Control; NPCA President, V. H. Montgomery, San Francisco; Bayard F. Bjornson, See-Jay Maintenance Co.; Merle H. Weaver, PCO; E. A. (Van) March, Van-Wan Fog Equip. Co.; Wendel Fisher, Paramount Pest Control Service; Claude M. Snow, Snow Insecticide Co.; and unnamed owner of the night club. All are from Portland, Oregon, except Montgomery.

## Iowa PCA Meets Sept. 22, 23

The Iowa Pest Control Association is scheduled to hold its next meeting at the Blackhawk Hotel in Davenport on September 22 and 23. There will be a discussion on fly control and this season's results by Harold Gunderson and a demonstration of fly spraying by the Brookfield Pest Control Co. Henry Turrie, of Wil-Kil Pest Control in Milwaukee, Wisc., will discuss rat control, proofing and baiting. There will also be a visit to the city dump and to the Bettendorf garbage fill and a discussion of health and sanitation. H. R. Isherwood and Arthur Ochs, of the Antimite Company, will close the meeting's formal program with a talk on termite control.

## Combine With Rodent School

The Missouri Pest Control and the Kansas Termite and Pest Control Associations will hold a joint meeting September 16 and 17 in the Red Cross Building, Kansas City, Mo. This is to be in conjunction with the U. S. Public Health Service Rodent School to be held September 12-23.

## Florida PCA Picks Committees

H. O. Earnest, president of the Florida Pest Control Association, has announced the following committee appointments for the year 1949-50:

*Liaison:* W. A. Snare, Biscayne Exterminating Co., Miami, chairman, S. A. Sossamon, Termini Co., Tampa, and W. A. Helms, Orkin Eterminating Co., Jacksonville; *Ethics:* Bernard Kolkana, Orkin Exterminating Co., Miami, chairman, Claude Strickland, Tri-City Service & Distr. Co., St. Petersburg, and J. Y. Rudler, Rudler Exterminating Co., Orlando; *Membership:* Earl Whitford, Apex Pest Control Service, Miami, chairman, T. A. Fahey, Sarasota, Newton Weiss, Southern Laboratories, St. Petersburg, F. Peter Clements, Clements Services, Ft. Lauderdale, W. J. Horton, City Pest Control, Jacksonville, and Sam Walkup, Orkin Exterminating Co., Tallahassee; *Constitution & By-Laws:* W. B. Gresham, Jr., Young-Jones Laboratory, Inc., Tampa, chairman, John Paul Jones, Pensacola, and J. M. Roper, Pan-American Chemical Co., Miami; and *Parliamentarian:* Dr. John T. Creighton, head, Dept. of Entomology, University of Florida, Gainesville.

## CALENDAR OF MEETINGS

**National Agricultural Chemicals Assn.,** (formerly AIF) Annual meeting, Spring Lake, N. J., Sept. 7-9.

**New England Pest Control Assn.,** Down East Outing, Boothbay Harbor, Maine, Sept. 9-11.

**American Chemical Society,** Atlantic City, New Jersey, Sept., 13-15.

**E. Pa. Pest Control Assn.,** meeting, Hotel Casey, Scranton, Pa., Sept. 15.

**Missouri Pest Control Assn.** and **Kansas Termite & Pest Control Assn.,** joint meeting, Red Cross Bldg., Kansas City, Mo., Sept. 16-17 (in conjunction with U. S. Public Health Service Rodent Control School, Sept. 12-23).

**American Institute of Park Executives,** annual convention, Book-Cadillac Hotel, Detroit, Michigan, Sept. 20-23.

**Tenn. Pest Control Assn.,** meeting, Nashville, Sept. 25-26.

**Minnesota Public Health Assn. Conference,** Niccolet Hotel, Minneapolis, Minn., Sept. 30.

**National Pest Control Assn. Convention,** Biltmore Hotel. Los Angeles, Cal., Oct. 17-19.

**International Assn. of Milk and Food Sanitarians Conference,** Deshler-Wallick Hotel, Columbus, Ohio, Oct. 20-22.

**Municipal Public Health Engineers Conference,** Hotel Statler, New York city, Oct. 23-24.

**Chemical Specialties Manufacturers Assn.,** (formerly NAIDM) Winter meeting, Mayflower Hotel, Washington, D. C., Dec. 4-5.

**Florida Pest Control Assn.,** meeting in conjunction with AAEE national convention, Tampa Terrace Hotel, Tampa, Dec. 13-16.

## Ga. PCA Picks Officers

News has just reached us that the Georgia Pest Control Association held its third annual meeting at the Savannah Hotel in Savannah, April 22 and 23, at which new officers were picked to serve for the coming year. Elected were: Karl P. Conradi, president; Fuman H. Yates, vice-president and R. L. Tindol, Jr., secretary-treasurer. The Board of Directors now is made up of Fred P. Wright, Glenn Burnett and Marcus Kaplan.

Highlight of the April meeting was a discussion on insecticides by Dr. W. E. Dove, and one on household insects by Dr. W. G. Bruce.

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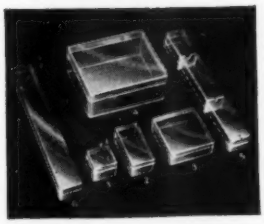

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## No Termites in White House

Newshawks invaded the White House in Washington recently during the current remodeling and one reporter said the place was so full of termites, his wife had to spend more than an hour picking them out of his clothing when he returned. CBS wanted to dramatize the situation by making a recording of the termites gnawing at the wood. The radio men called a DC-PCO and arranged to set up an elaborate recording mechanism next to an infested piece of lumber that never saw the President's home. The results were dissatisfying from CBS' viewpoint . . . picked up too many other noises.

Dr. T. E. Snyder, termite expert for the USDA, was called in to clear up all this nonsense and reports to us, after making a personal inspection of the White House, the structure has no termites. Says powder-post beetles had infested the house once many years ago, but he remembers directing the exterminating work himself and there is no trace of them left today.

## Aero-Mist Conversion Unit

A new Dust Hopper attachment which can convert their standard Aero-Mist Sprayers into either dry or wet dusters has been recently completed by Lawrence Aero-Mist Sprayer Co. of Greenfield, Mass.

The development is said to have been made to answer certain agricultural spraying requirements which use a dusting compound for insect pest control. The Hopper does not interfere with the normal use of the sprayer, holds 2 cublic feet of dust and will feed at the uniform rate of 2 to 10 pounds of dust per minute. Full information can be obtained from the company.

## Effective Pesticide

According to a copyrighted story in *Oil, Paint & Drug Reporter*, Dichlorodiphenyldichloroethane, an insecticide claimed as best kown for control of corn earworm, is deadly to flies, bedbugs, fleas and roaches and possesses insect-killing power comparable to DDT and is similiar in action, but safer to human beings, house pets, and farm animals.

## Monsanto Offers 2,4,5-T

Poison ivy plants have their match in a chemical weed-killer called 2,4,5 - Trichlorophenoxyacetic acid, 2,4,5-T, reports the Monsanto Chemical Co., St. Louis, Mo.

2,4,5-T, a new product for the company, is related to 2,4-D. It is claimed early tests indicate the new chemical is effective against brambles, brush and tree stumps which resist 2,4-D.

A hormone type chemical, 2,4,-5-T seems to affect plant respiratory action, and causes plants to become contorted and die. The best time to use it is spring and early summer, when plants are growing rapidly and the leaves are almost fully developed, according to Monsanto.

Reportedly, to kill poison ivy the bark and leaves should be thoroughly sprayed with a solution of 2,4,5-T. Preparations of 2,4,5-T for this purpose are available through established formulators of weed-destroying compounds.

## Flour Mill Guide

"A Guide for Flour Mill Sanitation" is a new, 102-page, spiral bound book by Dr. Roy K. Durham, Technical Service Director, Millers' National Federation, that should be in the library of every PCO doing work in food processing plants. In this guide, an attempt has been made to collect and to summarize the most important and most practical information in the mill sanitation field. It is written to enable operators to do the best possible job of insect and rodent control or prevention. Illustrated with photographs and drawings, the guide can be obtained for $2.50. Orders should be sent direct to the Millers' National Federation, 309 West Jackson Boulevard, Chicago 6, Illinois.

# PESTALES

### They Come Big in America

Angus had lived two months in America when he went to see a movie laid in the Canadian wilds. Presently he saw a close-up of a moose.

"I dinna ken what yon beastie is," he remarked to his companion.

His friend explained that it was a moose.

"A moose?" Angus cried. "Aweel, if that is a moose, I dinna want to meet an American rat then!"

* * * * *

### Stupid Question of the Month

Customer: "I want a quarter's worth of rat poison."

Druggist: "Do you want to take it with you?"

Customer: "No, I'll send the rats after it!"

* * * * *

### To Be Sure

Mrs. Muldoon (handing her husband a saucerful of white powder): "Patrick, taste that and tell me what you think it is."

Patrick: "Why, it tastes rather like baking soda."

Mrs. Muldoon: "That's what I told Bridget. The silly girl insists it is rat poison. — Just taste it again to be sure."

* * * * *

### Right Man for the Job

In Salt Lake City, William H. Slaughter heads the city's rat extermination drive.

* * * * *

### Smooth Sailing

Al Ogle of Lloyd's Pest Control Co., San Diego, California reports launching a new fast 22-foot cabin cruiser named the "May Dee" after his charming wife. We shall expect pictures of the first sword fish catch made from the new boat, or . . . at least a good "fish story" or two as to how the big ones got away. Looks like the Internal Revenue department didn't get all the collections, as some PCOs have led us to believe. Launching a boat so soon after March 15th looks as though Uncle Sam must have left some pin money anyway!

# *Two Kinds of PCOs--and Two Kinds of LUCIDE*

It's New . . .
It's News
It's PCE

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One PCO wants his Chlordane emulsion concentrates ready mixed . . . so all he has to do is add water on the job to get a superior finished product.

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That's why PCE makes two kinds of LUCIDE. And both LUCIDE A-20 and LUCIDE S-60 are ideal for their purpose — premium products at no premium price.

## LUCIDE A-20

A true colloidal emulsion of refined grade Chlordane • Fireproof • Ready mixed concentrate — just add water to produce a finished formulation • Won't harm brass or stainless sprayers, nozzles, or extensions • Stable, doesn't separate • Long-lasting residual effect • Resists re-emulsifying when wetted; ideal outdoors, under sinks, or in similar locations • Doesn't clog nozzles or strainers.

## LUCIDE S-60

A water miscible oil containing 60.3% refined grade Chlordane • Completely stable; won't separate • Produces factory-fresh 20% colloidal emulsion concentrate corresponding to Lucide A-20 — or any other desired concentrate of 35% or less — by mixing with water, according to simple directions • Economical • Saves space in storage • Money-saving in shipping • Keeps indefinitely in original lined container • Makes a superior Chlordane concentrate with longer lasting residual effect.

| LUCIDE A-20 | | LUCIDE S-60 |
|---|---|---|
| $4.25 per gal. | 55 gal. drum | $12.00 per gal. |
| $4.75 per gal. | 5 gal. container | $12.50 per gal. |
| $6.25 per gal. | 1 gal. container | $13.50 per gal. |

All prices are F.O.B. N.Y.C.

(Note: 1 gallon of Lucide S-60 makes 4 gallons of a product corresponding to Lucide A-20)

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The Kennadrill is a big cost reducer, a smooth, easy worker in any nonmetallic construction material you tackle. The sharp, hard point pierces smooth surfaces, drills clean, true, sharp edged holes.

Ejecting action of the blade "kicks" cuttings back so you go deeper and deeper without feeling the drill bind or stall. The shank is round so there are no flutes to pile up small cuttings and stop or twist the drill.

Progressive, cost-conscious pest control operators praise the Kennadrill for the way it minimizes man-hours . . . takes the high cost and drudgery out of masonry drilling. J. L. Purdy, Hamilton, Ohio, says, "This is really something. Over four hundred inches of cement. The point of the cutting edge shows no sign of wear, absolutely none. Please send me . . ." Bit sizes are from ¼" to 1½" and they are used in rotary drills. Get all the particulars. Write for folder PCK now.

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## CLASSIFIED ADVERTISEMENTS

When answering ads where box number only is given, please address as follows: Box number, c/o Pest Control, 1900 Euclid Building, Cleveland 15, Ohio.

**Rates:** "Position Wanted" 5c per word, minimum, $1.00. All other classifications, 10c per word, minimum $2.00. All classified ads must be received by Publisher at least two weeks preceding publication date and be accompanied by cash or money order covering full payment.

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Serviceman wanted. Must be very high character, able to meet public with ease. Subterranean termite knowledge an advantage. Excellent position. Write: John Paul Jones, Exterminator, 1400 North 9th Ave., Pensacola, Florida.

### FOR SALE

Full pest control business in fast-growing South Texas town; year around work; only ship fumigator here. Write box 219, Pest Control magazine.

### FOR SALE

Old established exterminating business for sale. Includes service contracts, chemicals, equipment, office furniture, large neon sign and a large office in midtown N.Y.C. at a low rental. Service includes New York city, Westchester County and New Jersey. Grosses $30,000 per year. Price $20 000 — Net terms arranged. Those financially responsible need apply. Box 797, New York city.

### FOR SALE

Established pest control business, panel truck and all latest equipment. Bargain price $1500. Reason for selling is ill health. For information, write P.O. Box 305, Carthage, Missouri.

### Resistance to Insecticides

*(from page 20)*

which were already characteristic of the population before the introduction of the insecticide, and hence accounted for its variation in resistance, it is quite possible that fresh mutation may arise at any time subsequently to bring about changes in resistance. According to modern genetic thought, however, such happenings are likely to be rather rare, although in very large populations, such as houseflies in nature, even a very low frequency will suffice as a nucleus of expansion under insecticidal selection. Of course, other mutations may also occur which will not in any way affect resistance.

*Artificially produced mutations*: There appears to be a common misconception regarding the artificial production of mutations and their relation to the causative agent. Chemicals, such as mustard gas, and physical agents, such as X-rays, may produce mutations which cause changes in the offspring of insects exposed to them. However, these changes in structure or physiological behavior are not likely to have any reference to resistance to the agent itself. In the case of resistance of houseflies to DDT, for instance, it is not beyond possibility that the DDT might cause mutations, although at present there has been no report of this, but such changes, if they were brought about in the progeny, would be very unlikely to have any bearing on resistance to the chemical. In other words, the insecticide may act as a sorting house for separating resistant strains, but it probably plays no part in manufacturing them.

*Breeding of domestic animals*: The breeding of domestic animals to bring about desired variations is a very familiar example of what can be done by the selective process. However, as will be seen later, too close an analogy should not be drawn between this and the production of insecticide-resistant insects in the field. At the same time as man selects these desired types he isolates them, usually under sheltered conditions most favorable to their welfare, whereas resistant strains of insects produced under field conditions still have to contend with the other unfavorable factors of the wild environment. However, the production of resistant strains under "sheltered" laboratory conditions can be likened to the propagation of domestic animals.

**Part Two will be published in Oct. issue.**

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of PEST CONTROL
FORMERLY PESTS AND THEIR CONTROL

**This Year's Convention Meeting** will be divided into two groups: one for termite control and the other for general pest control with combined sessions later to share with the whole group developments coming out of the separate discussions.

**Reader Interest Assured in this issue.** Articles pertinent to both discussion groups will be included in the October issue of PEST CONTROL along with advance details and program of the Los Angeles convention.

**Circulation will be the largest in our 16-year history. (3,000).** Copies of PEST CONTROL will be liberally distributed at the convention and to other interested pest control operators whether subscribers or not.

**Advertising Rates** will be furnished gladly on request. They provide the lowest cost method of reaching this profitable market.

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**who** want to help their sales program with an added punch —

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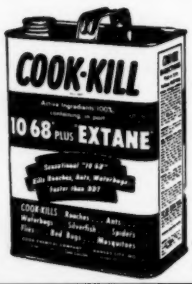


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